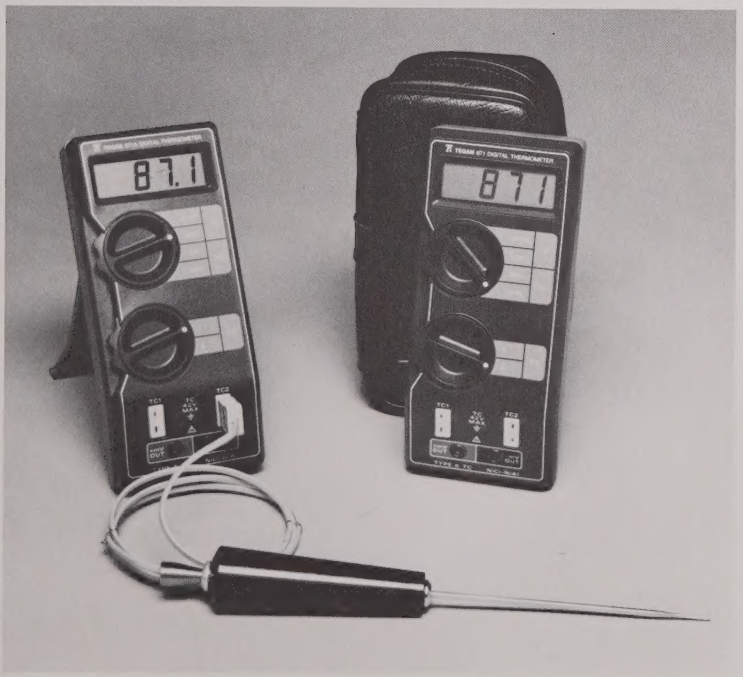
Keithley

# TEGAM

## Models 871 & 871A
## Digital Thermometer
### Instruction Manual

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# 871 SPECIFICATIONS

**TEMPERATURE SENSOR:** Type K (NiCr-NiAl) thermocouple.

**THERMOCOUPLE INPUTS:** Two, switch selected.

**RANGES**

| Ranges | Temperature Span | Resolution |
|---|---|---|
| 200°F | −40.0 to 199.9°F | 0.1°F |
| 2000°F | −40 to 1999°F | 1°F |
| 200°C | −40.0 to 199.9°C | 0.1°C |
| 1370°C | −40 to 1370°C | 1°C |

**ACCURACY:** ±0.25% of reading ±1°C(0.25% ± 1.8°F) for one year, 18° to 28°C ambient. Includes NBS conformity, cold junction compensation and repeatability errors. Excludes thermocouple errors, however, thermocouple errors around 0°C may be compensated for by an internal zero adjustment. Extended accuracy from −40°C to −55°C: +2°C max.

**REPEATABILITY:** ±0.2°C typical for 1 hour at constant ambient temperature.

**TEMPERATURE COEFFICIENT:** 18° to 28°C; Included in accuracy specification. From 0° to 18° and 28° to 50°C; less than ±(0.025% of reading +0.1°C)/°C.

**INPUT CURRENT:** 25nA typical; 50nA maximum.

**MAXIMUM ALLOWABLE TC INPUT OVERLOAD:** 35V•DC (42V peak AC)

**NORMAL MODE REJECTION RATIO:** Greater than 45dB at 50 & 60Hz.

**COMMON MODE REJECTION RATIO:** Greater than 120dB at DC, 50 & 60Hz.

**GENERAL**

**DISPLAY:** 3½-digit LCD, 0.6″ height. Polarity and decimal point indication.

**CONVERSION PERIOD:** 400ms (2.5 readings/sec.).

**OVERRANGE & OPEN-THERMOCOUPLE INDICATION:** 3 least significant digits blanked.

**mV OUTPUT:** Non-linearized, cold-junction compensated thermocouple output. (Not isolated from selected TC input.) Use the NBS Thermocouple Calibration Tables for converting voltage readings into temperature readings.

**mV OUTPUT ACCURACY** (18° -28°C): ±40μV (°C ranges); ±80μV (°F ranges). 0°C=0.0mV. Output resistance: 17K ohms.

**mV OUTPUT TEMPERATURE COEFFICIENT (O° -18°C & 28° -50°C):** Less than (0.1 x accuracy specification)/°C.

**mV OUTPUT PROTECTION:** 35V DC (42V peak) maximum; mV+ to mV− and selected TC input to mV+ or mV−.

**ENVIRONMENTAL LIMITS FOR OPERATING:** 0° to 50°C, less than 80% relative humidity up to 35°C, reduce R.H. limit by 3%/°C from 35° to 50°C. If the instrument has been stored above 18°C it may typically be operated at −10°C for 15 minutes.

**ENVIRONMENTAL LIMITS FOR STORAGE:** −35°C to 60°C, less than 90% relative humidity up to 35°C; reduce R.H. limit by 3%/°C from 35° to 60°C.

**INPUT CONNECTIONS:** Two, miniature TC connectors.

**mV OUTPUT CONNECTION:** Dual banana jacks.

**POWER:** 9V alkaline or carbon-zinc (NEDA 1604) battery.

**BATTERY LIFE (CONTINUOUS):** 100 hours typical with alkaline battery; 50 hours typical with carbon-zinc battery.

**BATTERY INDICATOR:** Display indicates "BAT" when less than 10% of life remains.

**DIMENSIONS, WEIGHT:** 178mm long x 78mm wide x 42mm thick (7.0″ x 3.1″ x 1.6″). Net weight 300gm (10.6oz).

**ACCESSORIES SUPPLIED:** Battery, manual, Model 8712 Thermocouple Sensor.

[1]WARNING: A shock hazard exists when probes or sensors are exposed to voltage levels greater than 30V rms or 42.4V peak.

# 871A SPECIFICATIONS

**TEMPERATURE SENSOR:** Type K (NiCr-NiAl) thermocouple.

**THERMOCOUPLE INPUTS:** Two, switch selected.

**RANGES**

| Ranges | Temperature Span | Resolution |
|---|---|---|
| 200°F | −40.0 to 199.9°F | 0.1°F |
| 2000°F | −40 to 1999°F | 1°F |
| 200°C | −40.0 to 199.9°C | 0.1°C |
| 1370°C | −40 to 1370°C | 1°C |

**ACCURACY:** ±0.25% of reading ±1°C(0.25% ± 1.8°F) for one year, 18° to 28°C ambient. Includes NBS conformity, cold junction compensation and repeatability errors. Excludes thermocouple errors, however, thermocouple errors around 0°C may be compensated for by an internal zero adjustment. Extended accuracy from −40°C to −55°C: +2°C max.

**REPEATABILITY:** ±0.2°C typical for 1 hour at constant ambient temperature.

**TEMPERATURE COEFFICIENT:** 18° to 28°C; Included in accuracy specification. From 0° to 18° and 28° to 50°C; less than ±(0.025% of reading +0.1°C)/°C.

**INPUT CURRENT:** 25nA typical; 50nA maximum.

**MAXIMUM ALLOWABLE TC INPUT OVERLOAD:** 35V•DC (42V peak AC)

**NORMAL MODE REJECTION RATIO:** Greater than 45dB at 50 & 60Hz.

**COMMON MODE REJECTION RATIO:** Greater than 120dB at DC, 50 & 60Hz.

**GENERAL**

**DISPLAY:** 3½-digit LCD, 0.6″ height. Polarity and decimal point indication.

**CONVERSION PERIOD:** 400ms (2.5 readings/sec.).

**OVERRANGE & OPEN-THERMOCOUPLE INDICATION:** 3 least significant digits blanked.

**mV OUTPUT:** Non-linearized, cold-junction compensated, amplified thermocouple output. (Not isolated from selected TC input.)

On °C Scale
1mV/°C on 200°range
0.1mV/°C on 1370° range
0°C = 0 mV output

On °F Scale
5/9 mV/°F on 200° range
5/90 mV/°F on 2000° range
0°F = 0 mV output

**mV OUTPUT ACCURACY:** (18°-28°C)
± (3% + 1mV) on 200° ranges,
± (3% + 0.1mV) on High ranges.
Includes TC non-linearity, excludes TC errors. Output resistance: 10K ohms.

**mV OUTPUT TEMPERATURE COEFFICIENT (0°-18°C & 28°-50°C):** Less than (0.1 x accuracy specification)/°C.

**mV OUTPUT PROTECTION:** 35V DC (42V peak) maximum; mV+ to mV− and selected TC input to mV+ or mV−.

**ENVIRONMENTAL LIMITS FOR OPERATING:** 0° to 50°C, less than 80% relative humidity up to 35°C, reduce R.H. limit by 3%/°C from 35° to 50°C. If the instrument has been stored above 18°C it may typically be operated at −10°C for 15 minutes.

**ENVIRONMENTAL LIMITS FOR STORAGE:** −35°C to 60°C, less than 90% relative humidity up to 35°C; reduce R.H. limit by 3%/°C from 35° to 60°C.

**INPUT CONNECTIONS:** Two, miniature TC connectors.

**mV OUTPUT CONNECTION:** Dual banana jacks.

**POWER:** 9V alkaline or carbon-zinc (NEDA 1604) battery.

**BATTERY LIFE (CONTINUOUS):** 100 hours typical with alkaline battery; 50 hours typical with carbon-zinc battery.

**BATTERY INDICATOR:** Display indicates "BAT" when less than 10% of life remains.

**DIMENSIONS, WEIGHT:** 178mm long x 78mm wide x 42mm thick (7.0″ x 3.1″ x 1.6″). Net weight 300gm (10.6oz).

**ACCESSORIES SUPPLIED:** Battery, manual, Model 8712 Thermocouple Sensor.

[1]WARNING: A shock hazard exists when probes or sensors are exposed to voltage levels greater than 30V rms or 42.4V peak.

## GENERAL INFORMATION

The Models 871 and 871A are supplied ready for use with a battery and a thermocouple probe (Model 8712). The thermometer is designed to work with any type-K thermocouple probe or sensor that is terminated with a miniature thermocouple plug. Descriptions of other available probes and accessories can be found below.

## MANUAL ADDENDA

Any changes to the instrument which occur after the printing of this manual will be explained in an addendum included with the instrument.

## OPTIONAL ACCESSORIES

The following optional accessories can be used with the Models 871 and 871A and are obtainable through any Tegam distributor or directly from the factory.

**Model 1304 Soft Carrying Case and Stand** for the Models 871, and 871A.

**Model 1306 Heavy Duty Carrying Case** is a rugged carrying case that is large enough to accommodate the Model 871 or 871A plus various other articles such as a spare battery, manual, the Model 8712, etc.

**Model 8700 Carrying Case With Belt Clip & Holster** for the Model 8714 Probe.

**Model 8711A Thermocouple Kit** includes Model 8712 Thermocopule Sensor, 6m (20') of AWG #24 type K duplex TC wire, miniature TC plug and jack, standard TC plug and jack.

## PROBES AND SENSORS

**Model 8712 Thermocouple Sensor** consists of a three foot TC wire sensor that has a beaded thermocouple junction.

**Model 8713 Immersion Probe** for liquid and general purpose applications up to 900°C.

**Model 8714A Penetration Probe** with coiled cord for measurements of soft and semi-frozen solids.

**Model 8715 Surface Probe** for measurement of flat surfaces of solids.

**Model 8716 Air/Gas Probe** — Exposed junction within protective shroud responds to ambient temperature while shielded from incident radiation.

## PREPARATION FOR USE

Carefully unpack the instrument from its shipping carton and inspect it for any obvious signs of physical damage. Report any damage to the shipping agent at once. The following items are included with every shipment.

1. Model 871 or 871A Digital Thermometer
2. Instruction Manual
3. Model 8712 Thermocouple Sensor
4. 9V Battery (NEDA 1604)
5. Optional accessories as requested.

## BATTERY INSTALLATION/REPLACEMENT

A 9V battery is supplied with the instrument but not installed. Read over the following installation instructions before attempting to install or remove the battery.

### WARNING

**Turn the instrument off and disconnect the input probes before replacing the battery. Put the cover back into place on the battery compartment before resuming use of the instrument.**

Remove the cover from the battery compartment by sliding it off in the direction of the arrow. The battery connector snaps on and off the terminals of the battery. Improper installation of the battery will cause the connecting wires to be severed by excess strain. Proper installation requires that the battery be positioned in such a manner (see Figure 1) that the leads protruding from the boot of the battery connector face toward the outside of the battery compartment. If the instrument is going to be stored for a long period of time or in a high temperature environment, remove the battery to prevent leakage damage.

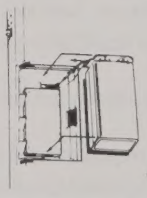
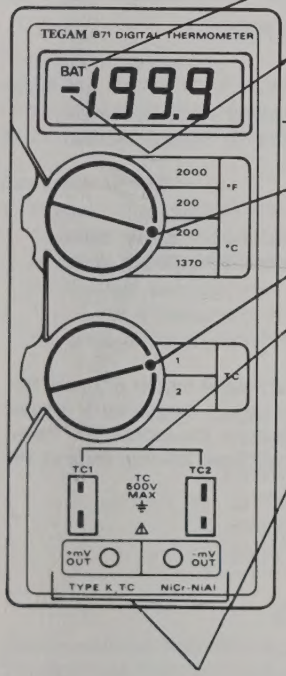


**Figure 1. Battery Installation**

# OPERATION

The Models 871 and 871A Digital Thermometers require the use of K-type TC probes/sensors, such as the Model 8712 Thermocouple Sensor which is a supplied accessory.




Low Battery Indicator

Minus sign displayed; plus sign implied.

1 Overrange condition or open thermocouple.

**1. SET POWER ON.**

**2. SELECT SCALE AND RANGE.**
Fahrenheit: 200°F or 2000°F
Celsius: 200°C or 1370°C

**3. SELECT THERMOCOUPLE-TC1 or TC2.**

**4. INPUT CONNECTORS TC1 and TC2.**
The instrument will accommodate one or two probes/sensors that are terminated with miniature type K TC plugs.

**5. ANALOG OUTPUT JACKS.**
+mV OUT and −mV OUT — Use a recorder to monitor temperature or a sensitive DMM to make high resolution readings. See "Specifications" on pages 1 and 2 of this manual for mV output levels.

**Figure 2. Control Layout**
**(Model 871 Shown, Model 871A is the same)**

## SAFETY SYMBOLS AND TERMS

The symbol on the instrument denotes that the user should refer to the operating instructions.

The **WARNING** used in this manual explains dangers that could result in personal injury or death.

The **CAUTION** used in this manual explains hazards that could damage the instrument.

### WARNING

**A shock hazard exists on the instrument's input terminals when probes or sensors are exposed to voltage levels greater than 30V rms or 42.4V peak.**

### CAUTION

**To avoid instrument damage do not apply more than 35V•DC (42V peak AC) from the selected TC input to mV+ or mV– outputs.**

### NOTE

Analog output source resistance is 17K ohms for the model 871 and 10K ohms for the model 871A. External load resistance of 1 megohms or greater will keep loading error at 1.7% of reading or less for the model 871. External load resistance of 1 megohms or greater will keep loading error at 1% of reading or less, for the model 871A.

# SERVICING INFORMATION

This section contains servicing information for the Models 871 and 871A.

## WARNING

**The information presented in this section is intended only for qualified personnel. Turn off the power before replacing the battery. Replace all covers before connecting the instrument to potentially hazardous voltages.**

## VERIFICATION PROCEDURE

**Functionality Check:**
While holding the tip of a clean TC probe between your thumb and index finger, a reading ascending to between 25° and 40°C should be obtained to confirm the functionality of the instrument.

**Accuracy Check:**
1. Prepare a pure-water ice bath. (See Calibration Setup Procedure).
2. Connect a TC probe to input channel 1 (TC1) of the instrument.
3. Immerse the TC probe into the pure-water ice bath and allow 10 minutes for thermal stabilization.
4. Turn on the instrument and use the following table to verify that the readings on each range are within specifications.

**Table 1. Verification Summary**

| Range | Allowable Reading |
|---|---|
| 2000°F | 32° ±2° |
| 200°F | 32.0° ±1.8° |
| 1370°C | 0° ±1° |
| 200°C | 0.0° ±1.0° |

## CALIBRATION

**Environmental Conditions:**
The instrument should be at an ambient temperature of 23° ±1°C; relative humidity less than 80% during calibration.

**Equipment Needed:**
1. DC Voltage Calibrator with ±0.01% of setting ±20μV accuracy (Fluke 341A or equivalent).

2. 100:1 divider — 1.98k ohms and 20 ohms resistors, .02% ratio accuracy or better, Wirewound.
3. Pure-water ice bath — Dewar Flask or 1 quart thermos.
4. K-type TC wire terminated with a standard miniature type K TC plug (see Figure 3) and a copper wire pair.

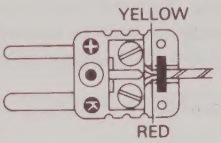


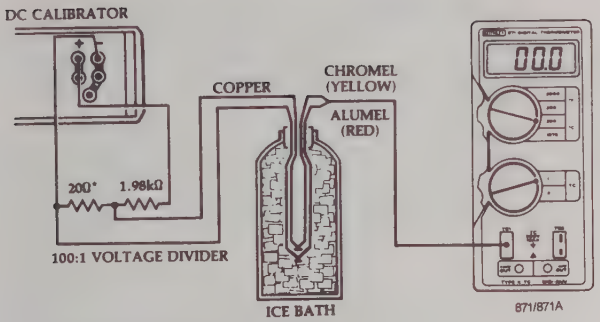

**Figure 3. Type K TC Plug**

**Calibration Set-Up:**

1. Turn on voltage calibrator.
2. Connect the TC plug (Figure 3) to the TC1 input of the Model 871/871A.
3. Splice copper wires to the TC wires. Crimp lugs can be used for making the splice.
4. Connect the other ends of the copper wires to the 100:1 divider as shown in Figure 4. Connect the copper/iron wire to the positive side.
5. Connect the 100:1 divider to the DC voltage calibrator as shown.
6. Prepare the pure water ice bath as follows:
   a. Drill a hole in the cap of a Dewar flask or thermos to accommodate the thermocouples
   b. Firmly pack the flask with pea-size ice cubes made from distilled water, and then fill the flask with distilled water.
   c. Replace the melted ice with more ice while removing the excess water.
   d. Place the cap on the flask. Immerse the thermocouples into the flask and allow 20 minutes for temperature stabilization.

**Calibration Procedure:**

1. Remove the battery cover and trimmer compartment cover from the Model 871/871A. (See Figure 5.)
2. Turn the Model 871/871A on and perform the calibration adjustments listed in Table 2.




*The 200 resistor must be held at a uniform temperature during calibration.

**Figure 4. Setup Procedure**

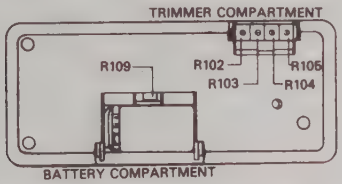



**Figure 5. Model 871/871A Rear Panel**

**Table 2. Calibration Adjustments**

| Step | Adjustment | 871/871A Range | Calibrator Setting (V) | Trimmer Adjust | Desired Reading |
|---|---|---|---|---|---|
| 1 | Input Offset Null | 200°C | 0.0000 | R109 | 00.0°C |
| 2 | +Gain (x 1) | 1370°C | 5.3093 | R104 | 1320°C |
| 3 | +Gain (x 10) | 200°C | 0.6939 | R105 | 170.0°C |
| 4 | −Gain | 200°C | −.1527 | R103 | −40.0°C |
| 5 | °F Offset | 200°F | 0.0000 | R102 | 32.0°F |

## PROBE MATCHING

To improve the accuracy of the Model 871/871A while using a particular probe, the calibration of the instrument can be adjusted so that probe errors in the region of zero (0°C) can be compensated. Place the probe in an ice bath and allow the reading to stabilize. Then reset the zero adjustment (R109) to a 0.0°C reading.

# DISASSEMBLY INSTRUCTIONS

Place the unit face down on a bench or other similar surface and remove the battery compartment cover. Remove and disconnect the battery. Remove the two #4-40 x 7/8 retaining screws (see Figure 6).

Grasp the bottom cover at the input jack end and with a lifting and forward pushing motion, carefully remove the bottom cover. While removing the cover, feed the battery connector through the access opening in the bottom of the battery compartment.

The component side of the PC board is now exposed and the battery can be reconnected for troubleshooting. To read the display, some light downward pressure at the top end of the circuit board will be required in order to make contact through the conductive elastometer strip, between the circuit board and the LCD.

The PC board and LCD assembly are not secured once the case retaining screws are removed. Be careful not to allow the PC board and LCD assembly to fall out or shift out of position.

To remove the PC board from the top cover, grasp the TC switch assembly and lift the board from the cover. The two switch knobs will remain in the case.

The LCD assembly will remain in the top cover when the PC board is removed. Again, be careful not to allow the LCD assembly to fall out accidentally.

The LCD assembly, along with the strip connector, lifts out of the case.

To reassemble, reverse the above procedure.

**NOTE**

Proper alignment of the strip connector is necessary when reinstalling the LCD assembly. If the strip connector has a conductor side, make sure that side is positioned against the plastic support of the LCD assembly.

**WARNING**

**Be sure to replace the on-off switch cover. Common-mode voltage will be present on the switch, creating a possible hazard if the cover is not replaced.**

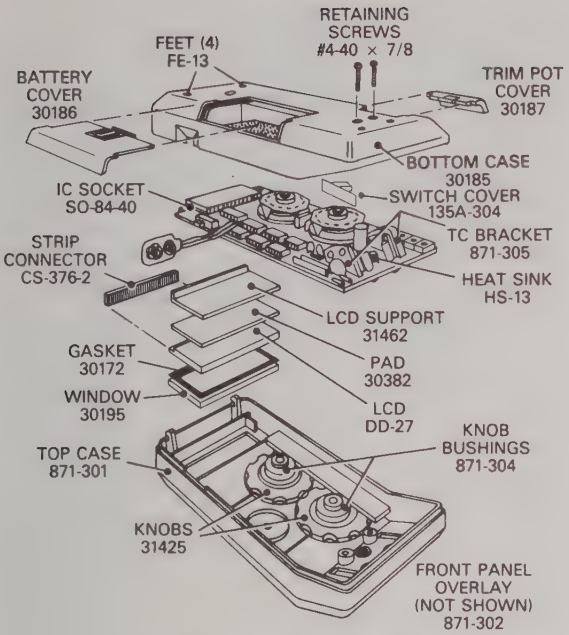



**Figure 6. Exploded View**

## TROUBLESHOOTING GUIDE

The following troubleshooting information is intended to be used by qualified electronic maintenance personnel who are familiar with the proper use of standard electronic test equipment.

To gain access to the PC board, refer to the first three paragraphs of the disassembly instructions. Utilize the parts list, schematic and component layout for identifying parts and check point locations. The following checks should be made with the instrument set to the 200°C Range.

**DC Voltage Checks**

1. Battery: $V_{BAT} > 7V$
2. Power Supplies:
   V+ to ▽ (Analog Common) = +2.8±0.4V
   V+ to ▼ (Digital Common) = +5±1V

3. Reference Diode: CR101 to ⏚ = −1.23±0.03V
4. Negative Reference Divider: (Reference to ⏚ )

**R119**

| Pin | mV* | Pin | mV* | Pin | mV* |
|---|---|---|---|---|---|
| 2 | −210 | 5 | −204 | 8 | −195 |
| 3 | −209 | 6 | −199 | 9 | −186 |
| 4 | −204 | 7 | −198 | 10 | −173 |

*The setting of R104 and the tolerances of the resistors within the network (R119) can affect these levels by ±5%.

5. Deintegrate Comparators:
   U103, Pin 3 to ⏚ = 150±25mV
   U103B, Pin 6 to ⏚ = −150±25mV
6. Cold Junction Volage:
   (Ambient Temperature 25°±3°C)
   −COM to ⏚ = 1.0±0.6mV

**Waveform Checks: (Referenced to ⏚ )**

| | | | |
|---|---|---|---|
| Clock | U111, Pin 3 | 360kHz, 5V pp | Square Wave |
| A/D Clock | U112, Pin 5 | 40kHz, 5V pp | Rectangular Wave |
| Ref. Clock 1 | U102, Pin 9 | 60kHz, 5V pp | Rectangular Wave |
| Ref. Clock 2 | U102, Pin 14 | 6kHz, 5V pp | Rectangular Wave |
| Backplane | U101, Pin 20 | 50Hz, 5V pp | Rectangular Wave |

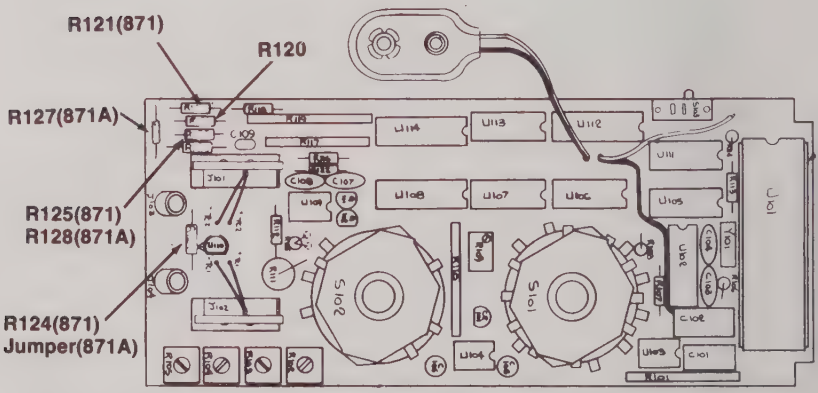
## PARTS LIST

| Circuit Desig. | Description | Schematic Location | Tegam Part No. |
|---|---|---|---|
| BT101 | Battery, 9V, NEDA 1604 | H4 | BA-14 |
| C101 | Cap, .22 $\mu$F, 100V, Polyester | G3 | C-305-.22 |
| C102 | Cap, .1 $\mu$F, 100V, Polypropylene | G3 | C-306-.1 |
| C103 | Cap, 470pF, 1000V, Ceramic Disc | E2 | C-64-470p |
| C104 | Cap, 220pF, 1000V, Ceramic Disc | D2 | C-64-220p |
| C105 | Cap, 10 $\mu$F, 16V, Aluminum Electrolytic | H4 | C-321-10 |
| C106 | Cap, 10 $\mu$F, 16V, Aluminum Electrolytic | H5 | C-321-10 |
| C107 | Cap, 33pF, 1000V, Ceramic Disc | C2 | C-64-33p |
| C108 | Cap, 47pF, 1000V, Ceramic Disc | B2 | C-64-47p |
| C109 | Cap, .1 $\mu$F, 16V, Ceramic Disc | C3 | C-238-.1 |
| CR101 | Diode, Low Voltage Reference | D6 | DZ-62 |
| DS101 | Liquid Crystal Display 3½ digit | F5 | DD-27 |
| J101 | Connector, TC, Female | A1 | CS-438 |
| J102 | Connector, TC, Female | A2 | CS-438 |
| J104 | Jack, Female | C3 | 130A-303 |
| J105 | Jack, Female | C3 | 130A-303 |
| J106 | Connector, Battery | H4 | BH-29 |
| Q101 | Transistor, NPN, Silicon, 2N3904 | B2 | TG-47 |
| Q102 | Transistor, NPN, Silicon; 2N3904 | B2 | TG-47 |
| R101 | Thick Film Resistor Network | Sev | TF-120 |
| R102 | Pot, 100k$\Omega$ | A3 | RP-97-100k |
| R103 | Pot, 2k$\Omega$ | D2 | RP-97-2k |
| R104 | Pot, 1k$\Omega$ | B4 | RP-97-1k |
| R105 | Pot, 500$\Omega$ | C2 | RP-97-500 |
| R106 | Resistor, 180k$\Omega$, 5%, 1/4W, Comp | G3 | R-76-180k |
| R107 | Resistor, 47k$\Omega$, 5%, 1/4W, Comp | D4 | R-76-47k |
| R108 | Resistor, 470k$\Omega$, 5%, 1/4W, Comp | E3 | R-76-470k |
| R109 | Pot, 2k$\Omega$ | A3 | RP-104-2k |
| R110 | Thick Film Resistor Network | Sev | TF-132 |
| R111 | Resistor, 10k$\Omega$, 10%, 2W, Comp | B1 | R-3-10k |
| R112 | Resistor, 10M, 10%, 1/4W, Comp | B1 | R-76-10M |
| R113 | Resistor, 5.1k$\Omega$, 5%, 1/4W, Comp | E1 | R-76-5.1k |
| R114 | Resistor, 1M$\Omega$, 5%, 1/4W, Comp | E1 | R-76-1M |
| R115 | Resistor, Selected, 1%, 1/8W, MtF. | B2 | R-88-* |
| R116 | Resstor, Selected, 1%, 1/8W, MtF. | B2 | R-88-* |
| R117 | Thick Film Resistor Network | Sev | TF-122 |
| R118 | Resistor, 150k$\Omega$, 5%, 1/4W, Comp | C5 | R-76-150k |
| R119 | Thick Film Resistor Network | Sev | TF-121 |
| R120 | Resistor, 10k$\Omega$, 5%, 1/4W, Comp | C2 | R-76-10k |
| R121† | Resistor, 10k$\Omega$, 5%, 1/4W, Comp | C2 | R-76-10k |
| R122 | Resistor, Selected, 5%, 1/4W, Comp | A3 | R-76-* |

## PARTS LIST (Cont.)

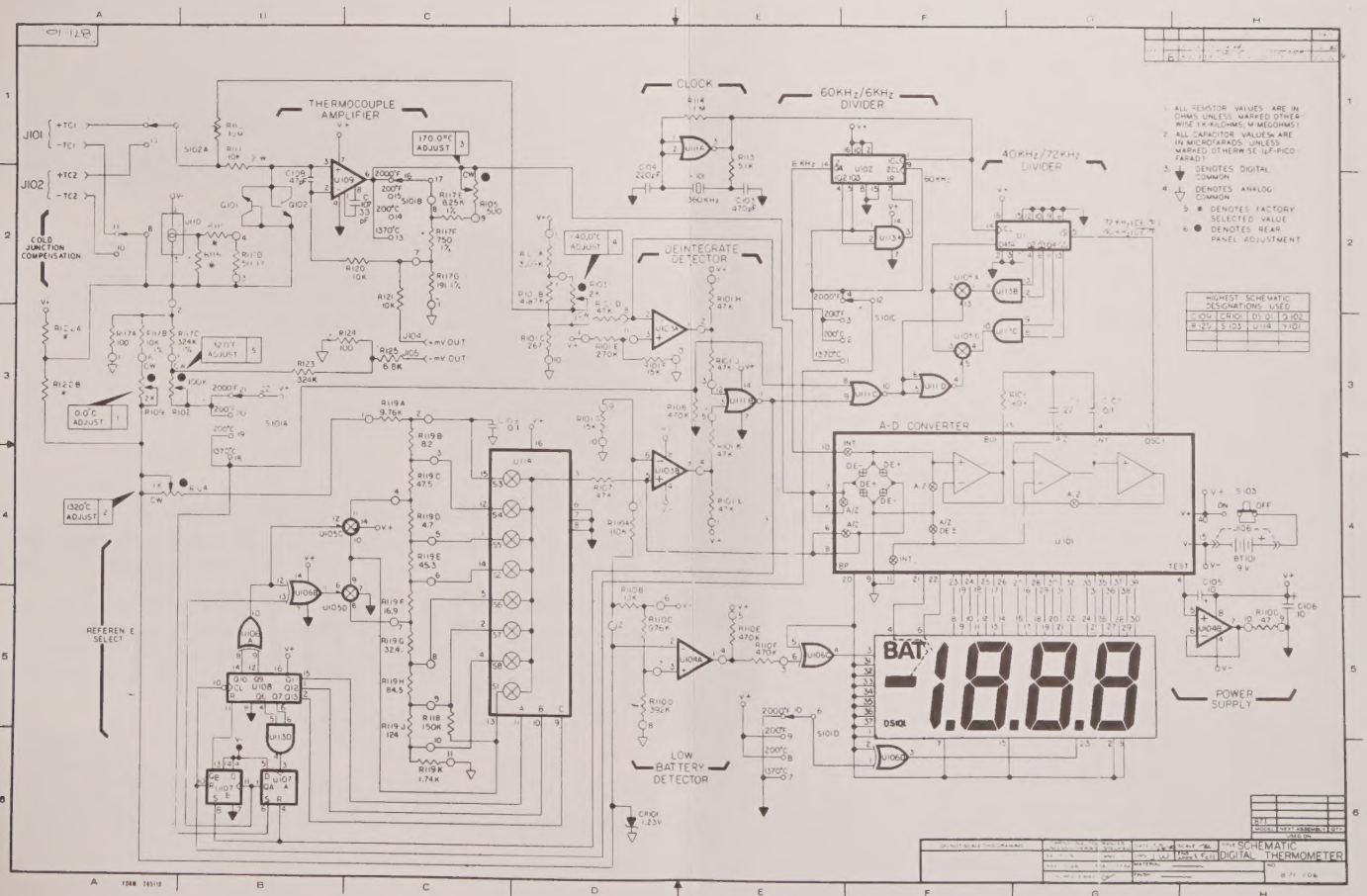
| Circuit Desig. | Description | Schematic Location | Tegam Part No. |
|---|---|---|---|
| R123 | Resistor, 324k, 1%, 1/8W, MtF. | B3 | R-88-324k |
| R124† | Resistor, 100Ω, 1%, 1/8W, Comp | B3 | R-88-100 |
| R125† | Resistor, 6.8k, 5%, 1/4W, Comp | C3 | R-76-6.8k |
| R126 ± | Resistor, 10k, 0.1%, MF | D1 | R-179-10k |
| R127 ± | Resistor, 9.9k, 0.1%, MF | D1 | R-179-9.9k |
| R128 ± | Resistor, 4.7k, 5%, 1/4W, Comp | D1 | R-76-4.7k |
| S101 | Switch, Rotary | Sev | SW-428 |
| S102 | Swtich, Rotary | B1 | SW-438 |
| S103 | Swtich, SPDT, ON-OFF | H4 | SW-417 |
| TC-1,2 | TC Cable | A1, A2 | SC-87 |
| U101 | 3½ Digit Single Chip A/D Converter | G4 | LSI-22 |
| U102 | Dual Synchronous Up Counter | F1 | IC-282 |
| U103 | Low Power JFET Input Op Amp | D3, D4 | IC-279 |
| U104 | Low Power JFET Input Op-Amp | E5, H5 | IC-279 |
| U105 | COS/MOS Quad Bilateral Switch | Sev | IC-149 |
| U106 | CMOS Quad Exclusive OR Gate | Sev | IC-226 |
| U107 | Dual "D" Type Flip-Flop | B6 | IC-103 |
| U108 | 14-Stage Binary Counter | B5 | IC-280 |
| U109 | Linear Op Amp | B2 | IC-203 |
| U110 | Current Source | A2 | IC-278 |
| U111 | Quad 2-Input NOR Gate | Sev | IC-108 |
| U112 | COS/MOS Divide by N Counter | G2 | IC-145 |
| U113 | Quad, 2-Input, AND GATE | Sev | IC-138 |
| U114 | Analog Multiplexer | D4 | IC-277 |
| Y101 | Resonator, 360kHz | E2 | CR-14 |

† = Used in Model 871 only
± = Used in Model 871A only

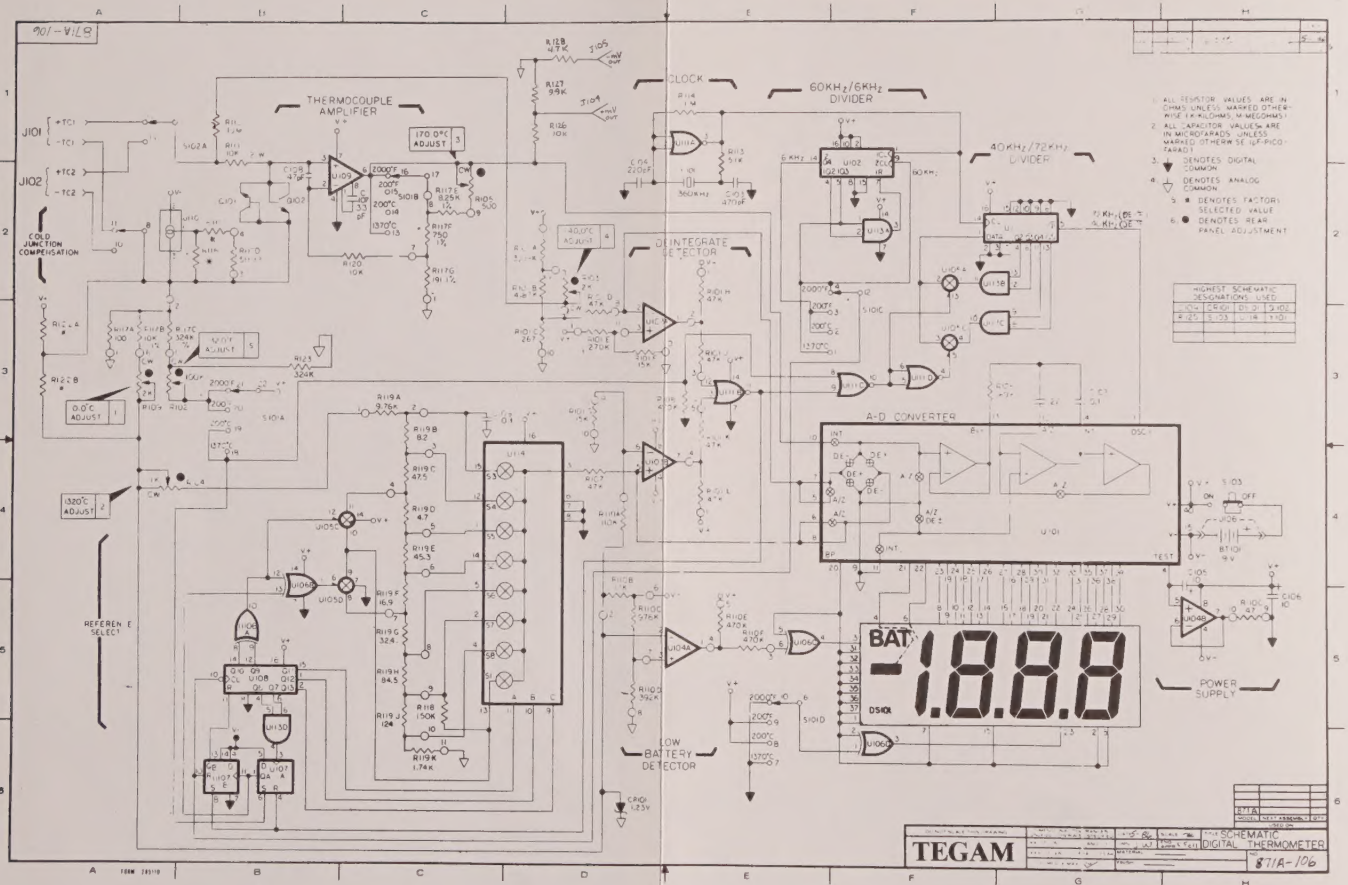



COMPONENT LAYOUT

# SCHEMATIC
# MODEL 871 DIGITAL THERMOMETER



# SCHEMATIC
# MODEL 871A DIGITAL THERMOMETER



## WARRANTY

Tegam, Inc. warrants this product to be free from defects in material and workmanship for a period of one year from date of shipment. During the warranty period, we will, at our option, either repair or replace any product that proves to be defective.

To exercise this warranty, write or call Tegam, Inc. in Madison, Ohio. You will be given prompt assistance and return instructions. Send the instrument, transportation prepaid, to the indicated service facility. Repairs will be made and the instrument returned, transportation prepaid. Repaired products are warranted for the balance of the original warranty period, or at least 90 days.

## LIMITATION OF WARRANTY

This warranty does not apply to defects resulting from unauthorized modification or misuse of any product or part. This warranty also does not apply to fuses, batteries, or damage from battery leakage.

This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for a particular use. Tegam, Inc. shall not be liable for any indirect, special or consequential damages.

## STATEMENT OF CALIBRATION

This instrument has been inspected and tested in accordance with specifications published by Tegam, Inc.

The accuracy and calibration of this instrument are traceable to the National Bureau of Standards through equipment which is calibrated at planned intervals by comparison to certified standards maintained in the Laboratories of Tegam, Inc.

# TEGAM

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